Crab Creek TMDL Implementation Plan Development – Montgomery County, VA

Agricultural & Residential Work Group Handout #2 – 3/13/2014

Meeting Goal

Include all stakeholders in developing a clean-up plan to reduce the levels of bacteria and sediment entering the Crab Creek watershed so it meets water quality standards that protect both recreation and aquatic life.

Primary Roles of the Residential Working Group

- Assist in determining types and extent of Best Management Practices needed
- Assist in determining cost for each BMP
- Identify economic incentives/hardships with each BMP
- Identify technical and financial resources to carry out Implementation Plan
- Report findings to the Steering Committee

Meeting Objectives

- Refine BMP unit and cost estimates
- Identify additional BMPs to include in the plan
- Identify additional resources needed to implement BMPs in the watershed
- Identify potential partnerships and funding sources for implementing the clean-up plan

Discussion Questions

- Are these BMP scenarios feasible?
    - Should we allocate stormwater BMPs between Stages 1 & 2? (Table 3)
    - Does the distribution between crop and pasture land seem correct?
    - For all pasture land, right now we are estimating 6% is high-till, is that reasonable?
    - What other assumptions or estimates need to be changed?
- Are the BMP cost-estimates accurate?
- What additional BMPs should be included in the clean-up plan?
    - Should we include pet waste composters?
- What type of educational efforts would work best in the watershed to support these BMPs?
- What other efforts are already being pursued or are planned in the watershed?
- What alternative funding sources are available?
- What should be the roles and responsibilities of the stakeholder organizations in these clean-up efforts?
- What resources are available for monitoring?
- How should efforts be prioritized?
- Steering Committee: Need Agricultural and Residential WG representatives
- Additional questions and/or concerns?

Background: Crab Creek Total Maximum Daily Load (TMDL) Study

It is the policy of the State of Virginia to ensure that water quality in all surface waters in the state is adequate for supporting all potential uses including drinking water supply, agricultural use, recreational use, and aquatic life. Crab Creek has been identified as not meeting water quality standards for fecal bacteria (E. coli). These waters do not fully support recreational activities such as swimming due to an elevated risk of infection and illness. A fecal bacteria pollution budget (which includes E. coli) completed by the Virginia Department of Environmental Quality (DEQ) in 2004 identified the sources of fecal bacteria pollution and the reductions needed to meet water quality standards in Crab Creek. Crab Creek also does not meet the General Standard which states that waters "shall be free from substances that are harmful to human, animal, plant, or aquatic life." The General Standard is evaluated by DEQ by applying the Virginia Stream Condition Index (VSCI) to benthic macroinvertebrate (aquatic insect) community data. The VSCI is a tool that incorporates many facets of the benthic macroinvertebrate community into one score. Using this tool, Crab Creek was found to be impaired for aquatic life. A stressor analysis completed in the 2004 TMDL for Crab Creek **identified sediment as the Most Probable Stressor in this waterway.** The 2004 TMDL estimated sediment source, loads, and the reductions needed to meet water quality standards in Crab Creek.

Implementation Plan

The goal of the Implementation Plan is to improve water quality in order to protect the use of Crab Creek for recreational activities such as swimming and for aquatic life. The water quality improvement plan will be implemented in an iterative process with objectives and milestones for each stage.

Objective	Stage 1	Stage 2
E.coli		
% Violations of the Geomean Standard	3.33%	0.00%
% Violations of the Instantaneous Standard	16.10%	10.46%
Average Annual Load (cfu/yr)	4.83E15	1.36E15
Sediment		
% Reduction	64%	65%
Average Annual Load	2,217.25	2,135.45

The proposed timeline for achieving Stage 1 objectives is ten years - by the year 2024. Sources may not be addressed equally along the timeline, e.g. it may be worthwhile to try to address all straight pipes and failing septic systems first.

Water quality modeling was used to investigate different scenarios for reducing bacteria and sediment from existing sources that would result in meeting the Stage 1 objectives described above. These scenarios demonstrate how reductions from different loading sources could be combined to meet water quality goals. The models are based on data for Crab Creek (e.g. flow data, bacteria data, topography, land use, soils, etc.).

Allocation scenarios for meeting the Bacteria TMDL for Crab Creek

	Percent Reduction in Loading from 2004 Condition						Percent Violations	
Scenario Number	**Direct Wildlife**	**NPS Wildlife**	**Direct Livestock**	**NPS Pasture/ Livestock**	**Res./ Urban**	**Straight Pipe/ Sewer Overflow**	**GM >126 cfu/ 100ml**	**Single Sample Exceeds 235 cfu/100ml**
1	0	0	0	0	0	0	76.7	27.8
2	0	0	0	0	0	100	73.3	27.8
3	0	0	90	50	50	100	11.7	17.6
4	0	0	100	60	60	100	3.33	16.1
5	0	0	100	99	99	100	0	1.92
6	0	99	100	99	99	100	0	1.53
7	99	99	100	99	99	100	0	1.53
8	0	99	100	99.95	99.95	100	0	0

Required sediment reductions for the Crab Creek Watershed

		Reductions Required	
Load Summary	**Crab Creek**	**T/yr**	**% of existing load**
Projected Future Load	7,197	4,978	78.9
Existing Load	6,307	4,088	64.8
TMDL	2,551		
Target Modeling Load	2,219		

Two sediment reduction alternatives are presented below. Alternative 1 requires sediment reductions from pastureland, channel erosion, and MS4 permitted areas. The reductions could be achieved through riparian buffers, livestock exclusion from streams, storm water management and improved pasture management. Alternative 2 requires reductions from pastureland, cropland, channel erosion, and MS4 permitted areas. Significant reductions appear feasible through the implementation of aggressive measures to minimize streambank erosion through improved stormwater control in urban areas, installation of riparian buffers, and livestock exclusion from streams. It is assumed in the TMDL that stormwater BMPs will be implemented with maximum effectiveness reducing the NPS loads from Phase II MS4 permit areas by 50%.

Sediment Reductions needed to achieve the Crab Creek Sediment TMDL

			Allocations			
			Alternative 1		Alternative 2	
Sediment Source	2012 Area (acres)	Existing Condition (T/yr)	(%)	(T/yr)	(%)	(T/yr)
LDR-PER	2,611.4	26.182	0	26.182	0	26.1820597
HDR-PER	7.1	0.076	0	0.076	0	0.07619608
COM-PER	669.7	6.211	0	6.211	0	6.21083391
Transitional	148.6	55.942	0	55.942	0	55.9418084
Forest	2,893.6	26.230	0	26.230	0	26.2303813
Disturbed Forest	89.7	87.672	0	87.672	0	87.671832
Pastureland	2997.1	1,363.023	38	845.074	38	845.07426
Cropland	1,159.3	275.904	0	275.904	42	160.02432
LDR-IMP	23.9	4.819	0	4.819	0	4.81871828
HDR-IMP	0.26	0.051	0	0.051	0	0.05115993
COM-IMP	32.9	6.658	0	6.658	0	6.65780156
Water	7.7	0.000	0	0.000	0	0
MS4-Existing	487.5	98.485	40	59.091	20	78.7881551
MS4-Future	197.7	39.931	40	23.959	20	31.9447391
NPS Load		**1,991.18**		**1,417.87**		**1,329.67**
Active Ag BMPs		-281.96		-281.96		-281.96
Channel Erosion		4,416.56	76	1059.975	74	1148.30586
Point Source Loads		21.23		21.23		21.23
Total		**6,147.01**		**2,217.11**		**2,217.25**
Target Allocation Load				**2,219.00**		**2,219.00**

Land Use Changes in the Crab Creek Watershed						
	Crab Creek Bacteria TMDL		Crab Creek Sediment TMDL - Projected Growth in 25 years		2012 NASS-NLCD Land Use Layer	
	Acres	*%*	*Acres*	*%*	*Acres*	*%*
Ag Land	6158.55	49	5,572.33	45	4,160.246	33
Developed	2248.52	18	2,942.09	24	5,268.576	42
Forest	4042.27	32	3,909.38	31	3,001.669	24

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